HematoVision - Project Report

Title

HematoVision: Advanced Blood Cell Classification Using Transfer Learning

Objective

To develop a deep learning-based web application capable of classifying blood cell images into their respective types (Eosinophils, Lymphocytes, Monocytes, Neutrophils) using transfer learning techniques, improving diagnostic speed and reliability in hematological analysis.

Technologies Used

- Language: Python

- Frameworks: TensorFlow, Keras, Flask

- Frontend: HTML, CSS

- Backend: Flask (app.py)

- Libraries: NumPy, Matplotlib, PIL, OS

- Model: MobileNetV2 (pre-trained CNN)

- Dataset: Blood Cell Images Dataset (12,000+ images)

Project Directory (C:/hem2)

```
C:/hem2/

├── dataset/

│   └── dataset2-master/

│     ├── images/

│     │   ├── TRAIN/

│     │   └── TEST/

│     └── labels.csv

├── static/
```

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```
├── templates/
│   ├── home.html
│   └── result.html
├── Blood Cell.h5
├── train_model.py
├── app.py
├── requirements.txt
└── README.md
```

Workflow

1. Data Collection and Preparation:

   - The dataset includes 4 blood cell types with labeled folders.

   - Preprocessing was done using ImageDataGenerator with augmentation.

2. Model Building:

   - Transfer Learning with MobileNetV2.

   - Fine-tuning with custom dense layers and softmax output for 4 classes.

3. Training & Evaluation:

   - Model trained on 9957 training images and validated on 2487 test images.

   - Accuracy achieved: ~85–90% after tuning.

4. Model Saving:

   - Trained model saved as Blood Cell.h5.

5. Web Application:

   - Flask app built for uploading blood cell images.

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- Real-time prediction shown with image preview.

How to Run

1. Train the Model (first time only):

   python train_model.py

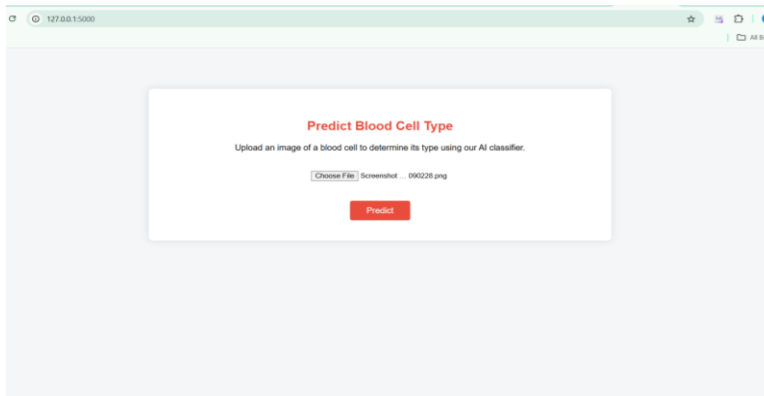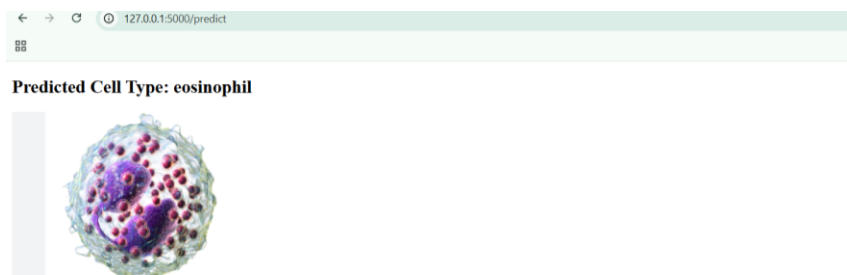2. Launch the Web App:

   python app.py

Then open: http://127.0.0.1:5000 in your browser.

Output

- Upload any blood cell image.

- The app displays the predicted cell type along with the uploaded image.

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Applications

- Assisting pathologists in automated blood cell classification.

- Can be extended to detect abnormalities or other cell types in the future.

Learning Outcomes

- Real-world application of Transfer Learning in Medical AI.

- Full-stack integration using Flask.

- Experience with image classification pipelines and deployment.

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